

REMARKS/ARGUMENTS

Claims 10-14 are pending. Claims 1-9 have been canceled without prejudice and without disclaimer. New claims 10-14 have been added. The specification and drawings have been amended to correct minor informalities. No new matter has been introduced. Applicants believe the claims comply with 35 U.S.C. § 112.

Applicants respectfully submit that independent claims 10 and 13 are patentable over Hasegawa et al. (US 6,807,034) and Brug et al. (US 5,930,087) because, for instance, they do not teach or suggest a spin valve structure; and a pair of electrodes provided on the sides of the spin valve structure for current to flow parallel to a track width direction; wherein the free magnetic layer has first and second free magnetic films sandwiching a non-magnetic intermediate film therebetween, the respective magnetizing directions of the first free magnetic film and the second free magnetic film are in antiparallelism, the length of the free magnetic layer in the direction of the track width is 200 nm or less, and a difference between a product of saturation magnetic flux density and a film thickness of the first free magnetic film and a product of saturation magnetic flux density and a film thickness of the second free magnetic film is within a range from 1 to 3 nmT.

Hasegawa et al. discloses a CPP-type dual spin valve thin element with a free layer including two magnetic sublayers and an intermediate sublayer placed therebetween (see, e.g., Abstract). It also discloses that the resultant magnetic moment (saturation magnetization $M_s \times \text{thickness } t$) of the free magnetic layer is preferably in the range of 5TÅ-60TÅ (col. 17, lines 44-46). Hasegawa et al., however, does not disclose CIP type spin valves. To the contrary, Hasegawa et al. points out the disadvantages of CIP type compared to CPP type spin valves (see, e.g., col. 2, lines 5-14; and col. 4, lines 23-27). Thus, Hasegawa et al. teaches away from CIP type spin valves. Brug et al. does not cure the deficiencies of Hasegawa et al.

In the claimed invention, the magnetoresistive head has a pair of electrodes provided on the sides of the spin valve structure for current to flow parallel to the track width direction, which is a CIP type different in structure from the CPP type taught in Hasegawa et al. It is known in the art that for different types of spin valves, the stress against the free layer

differs, which will lead to a different range for the difference between a product of saturation magnetic flux density and a film thickness of the first free magnetic film and a different range for the difference between a product of saturation magnetic flux density and a film thickness of the second free magnetic film.

In addition, Applicants believe the experimental data as present in Figures 7-10 are unexpected based on the 200 nm or less length of the free magnetic layer in the direction of the track width. The free magnetic layer in the magnetoresistive head has first and second free magnetic films sandwiching a non-magnetic intermediate film therebetween, and the respective magnetizing directions of the first free magnetic film and the second free magnetic film are in antiparallelism, the length of the free magnetic layer in the direction of the track width is 200 nm or less. The variations of output and the variation of asymmetry are reduced significantly when the length is 200 nm or less (see paragraphs [0042]-[0043]). The references do not teach this range or suggest the results of the significantly reduced variations.

For at least the foregoing reasons, claims 10 and 13, and claims 11, 12, and 14 depending therefrom, are patentable.

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PATENT

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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Attachments
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Amendments to the Drawings:

The attached sheets of drawings include changes to Figs. 7A-8C. These sheets, which include Figs. 7A, 7B, 8A, 8B, and 8C, replace the original sheets including Figs. 7 and 8.

Attachment: Replacement Sheets